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ABSTRACT

Many developing countries face severe problems in their education systems, and their search for solutions to these problems is conducted with great urgency. An important area where possible solutions are being examined is educational technology. This paper examines five questions which are important to its use in developing countries: (a) what are the main problems of education in the developing nations; (b) what is educational technology; (c) to what problems has it been applied and with what results; (d) what new approaches, developments and innovations are being prepared which are relevant to the developing nations; and, (e) what things must be done in educational technology, if it is to be truly responsive to their needs? In summary, it is concluded that developing countries must be shown the cost-benefit of educational technology. A bibliography is appended. (Author/MF)

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EDUCATIONAL TECHNOLOGY IN INTERNATIONAL DEVELOPMENT EDUCATION

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Abstract

Many developing countries face severe problems in their education systems and their search for solutions to these problems is conducted with great urgency. An important area where possible solutions are being examined is Educational Technology which seems to be responsive to the needs of the developing countries. This paper examines five questions which are important to the use of educational technology in developing countries. These questions are: (a) what are the main problems of education in the developing nations; (b) what is educational technology; (c) to what problems has educational technology been applied and with what results; (d) what new approaches, developments and innovations are being prepared which are relevant to the developing nations; and, (e) what things must be done in educational technology if it is to be truly responsive to the needs of the developing nations?

Introduction

Many developing countries face severe educational problems. These problems include who is to be educated, how to insure the quality of education in the face of pressures to take more and more students into the schools, how to reduce the number of students who are dropping out or repeating, how or whether to reduce the student-teacher ratio in the face of rising labor costs, how to provide adequate facilities for students in terms both of the quantity and the demands for quality, and many other problems. It is possible to divide these problems (Coombs, 1970, p. 5) into those caused by quantitative pressures, i.e., by the number of students to be educated, and those caused by the necessity to maintain qualitative standards in the education of the students, bearing in mind the complex interactions of the two classes of problems. The problems of the developing countries are more severe than those of the developed countries because the total amount of available resources (public and private) is lower, the pressure for education to contribute to the overall development program is greater, the need to offer more education to more students is greater, and the margins for error are slimmer. A developed nation can afford more mistakes, more experimentation, more waste than an underdeveloped nation. Obviously, the crisis of education is more strongly felt in the developing nations and the search for solutions is conducted with greater urgency.

An important new area where possible solutions are being examined is that area referred to as Educational Technology or Educational Systems Analysis and Development. The various features of the Educational Technology area are appealing in terms of the problems of the developing countries because they seem to be responsive to the needs of those countries. Emphasis on increased learning, different distributions of resources, utilization of various mechanical devices, new output measurement procedures, new staff performance and distribution definitions, and other innovations has distinct appeal to the Minister of Education who has to face the problems of the developing nation

An important consideration then is what does educational technology have to offer to the developing country? To answer this question it is necessary to examine (a) what are the main problems of education in developing nations, (b) what is educational technology, (c) to what problems has educational technology been applied and with what results, (d) what new approaches, developments and innovations are being prepared which are relevant to the developing nations, and (e) what things must be done in educational technology if it is to be truly responsive to the needs of the developing nations? This paper will address these questions and draw some conclusions from their answers.

Education is an important contributor to the general development of a nation's economy and many developing nations are focusing on and emphasizing the importance of the role of educational programs and problems as part of national planning, economics and political and social change. Educators use the phrase international development education to refer to this attention to education within the economic and political context. In this emphasis education is the study of the appropriate manner in which educational plans, programs and problems contribute to the growth and development of the country. Reasonably widespread agreement has been achieved on the meaning and significance of international development education (Spaulding, Singleton and Watson, 1968; Butts, 1969) and this area will be the primary area of attention for this paper.

Developing nations will include those labelled by Harbison and Myers (1964, pp. 23-48) as educationally underdeveloped, semi-developed and semi-advanced, or also those characterized by Rostow (1960) as being in the pre-industrial or take-off stages.

The Problems of Education in the Developing Nations

Most educators, political leaders and ordinary citizens of almost any nation in the world are in agreement on at least one issue -- the inadequacy of their educational system's response to the needs of their society. This inadequacy appears

in the socially and economically advanced nations as well as in the developing nations. Societal problems, advancing technology, growing urbanization, rapid changes in the nature of manpower needs have rendered obsolete and irrelevant much that is traditionally honored in conventional educational practice (Chadwick and Morgan, 1970). And yet the response to necessary change has been embarrassingly slow, and at times non-existent. Faced with huge increases in the number of students which the education systems must service, the normal approach has been to do the same old things for these growing numbers. This expansionist approach has been to enlarge the existing educational establishment as rapidly as possible, with very little change in the structure, logistics, content or method. The main purpose has been to increase the number and percentage of students attending educational institutions at every level (Coombs, 1970). This it has managed to do as rising enrollment statistics testify in almost all countries in the world.[1]

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1 For these statistics see Coombs (1968) Chapter One, and Appendices 1-5, 26 and 27.

The expansionist strategy has resulted in a crisis of maladjustment between educational systems and their environments as the simple expansion has not been an adequate response to educational problems. As the Report of the Commission on International Development, generally referred to as the Pearson Report, (1969, p.67) has emphasized,

> The impressive quantitative improvements in education should not be allowed to conceal the very serious problems of quality which plague the educational systems of so many countries.... Education is a basic human right and the low-income societies need literate citizens with skills appropriate to the changing economic structure. Yet, their educational systems fail to provide a satisfactory general education... appropriate to the needs of the country.

Other authors concur with Coombs and Pearson on the general nature of the problems facing the developing countries (Chadwick and Morgan, 1970; Klaus, 1970; Jacobs, 1969; Davis, 1965). Both qualitative and quantitative pressures are stressed and these pressures are not considered to be amenable to traditional approaches primarily because of lack of required resources in the developing countries. From these sources the major causes for the educational problems have been suggested. The first is the flood of students which has hit the school systems of the developing countries because of rising populations, newly developing

governments, changes in expectations of the populace and the changes in the concepts of education. The second cause is the rising costs of education against relatively scarce resources. Developing countries have high demands placed on them in many sectors of their economy. and they have scarce resources for which education has to complete. Rarely are magic solutions available to increase resources; they will always be to some extent scarce. The third cause is the inadequacy of the output of the schools. While the nature and degree of inadequacy is rarely thoroughly known it is caused by quantitative pressures on the schools which lead to qualitative sacrifices, by rapid changes and increases in information and knowledge in and about the world, and by changes in the types of manpower needs of the various developing countries. The fourth point, one which is emphasized most strongly by Coombs (1968,p. 165), is the inertia and inefficiency that is characteristic of educational systems which retain the same old organization, curriculum, methodology and reluctance to change their internal operating mechanism.[2]

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[2] It is appropriate to note that these problems are not solely limited to the developing countries. They are discussed here, in terms of developing countries because that is the interest of the paper, but many of the same problems are common in developed countries. The following quotation, which fits within the context of this discussion, is made about the most developed country

The quantitative and qualitative aspects of education in developing countries interact closely and the interaction causes problems. To see these it is necessary to examine the meaning of the terms, particularly as the nature of the qualitative aspects of education seems to bear directly on the potential contribution of educational technology. Extensive analysis of the meaning of quality has been made elsewhere (Coombs, 1968; Beeby 1966; Beeby, 1969) so only a brief review of the concept will attempted here.

The basic issue in the discussion of quality is the approach that is taken by a nation. Two general orientations are most predominant, the <u>productionist</u> ideal and the <u>democratic</u> or equalitarian or humanitarian ideal of education. In the former the primary aim is to have an education system which contributes as much as possible to the nation's ability to increase as much and as rapidly as possible the amounts of goods and services available to the community (Aron, 1969)

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the USA. "The crisis in education has been a long time building.. The iceberg image is unavoidable, most of the troubles have been with us for years - but nine-tenths submerged beneath a sea of public complacency and preoccupation with other matters. Today, however, no one can ignore the problems which are pressing in from every side." (Commission on Instructional Technology 1970, p. 11)

The democratic principle or ideal is that each individual receives as much education as he wants, or at least has a chance equal to that of each other member of his community. Aron suggest: that the productionist ideal is the one most widespread in the world today and that it is fundamentally in contradiction with the democratic ideal, and Beeby (1969) points out that it is much easier for the developing nations to focus on the productionist principle because it seems to be much more closely in line with the needs of training a relatively small elite of highly skilled persons and this sometimes means depriving some children of the amount or kind of education which they may desire.

A primary question is how much education can be offered by a developing nation to how many students. The application of the democratic or equalitarian ideal is certainly an optimal goal. The desirability of widespread education is widely accepted and like the enjoyment of health it has an independent value and has gradually acquired recognition as a human right (Myrdal, 1968, p. 1537). The United Nations' Universal Declaration of Human Rights, in Article 26 states that "everyone has the right to education," and particularly stresses that education at the elementary and fundamental levels should be available to all children on a free basis, with higher levels of education available as a matter of merit.

The application of the democratic ideal, i.e. to meet the widespread demand for education, to respond to frequently overwhelming political pressure to meet the demand, generally leads

to the spreading of already thin resources, in terms of classrooms, teachers, equipment, etc., over even more students, "until in many situations education (becomes a caricature of itself and a travesty." (Coombs, 1969, p. 20)[3] Peters (1969) also emphasizes that attempting to respond to demands for fairness or needs for certain categories of manpower can result in no students of adequate quality emerging from the system.[4]

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[3] This certainly is the situation occuring in Korea. In an attempt to meet the widespread demand for education the government has adopted a policy of "automatic" promotion which hides the inefficiency of the system. This results in a high degree of heterogeneity in the students because not all have completed grade level requirements. Then the government prohibits ability grouping of the students because to allow it would be to admit failure at earlier levels.

[4] From theoretical standpoint there is strong support for this statement from certain principles of general systems theory. It is a principle of this theory that if input into a system remains high, the system output will be less precise, and that if input continually increases strain will be produced in the system, and that, among other things, "systems act to continuously increasing strain first by a lag in output, then by an overcompensating output, and finally by a catastrophic collapse of the system." (Maccia, 1962, p. 7)

Anderson (1965) also notes the growth of the idea of education as a human right and analyzes the demands for equity as they may be balanced against requirements for efficient production of students. Reviewing several alternate definitions of equity he suggests that the most "realistic" is continued education so long as gains in learning per input of resources match some agreed upon norm. This may also be a definition of system efficiency and Anderson gives other definitions. The first is to..."give educational priority to those groups or areas where given inputs will evoke the largest response in attendance and in demand for further schooling." Anderson suggests this is the most practicable criterion. It relies on ability to sacrifice earnings and/or leisure and requires demonstrated aspirations and performance. Of course, it is a meritorious approach and favors the most developed groups in a society, and therefore offends many peoples, particularly those in lower social structures. His second definition is to maximize the ratio of economic gains to educational costs, which is what many developing countries attempt to do, and is an approach which tends to operate relatively well.[5]

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[5] This approach is described by Phillips who says, "It relates the stock of educated children and the flow of children and students completing education at the different levels directly to the national output of goods and services without passing through the intervening stage of making manpower forecasts." H.M. Phillips, (1964, p. 29).

Korean education is an example of this approach in its establishment of quotas in higher and secondary education. The third criterion is to rely on the country's rate of increase of per capita income, where education in general pays as long as overall economic output is growning satisfactorily.[6]

The discussion of quality is placed within the framework of the systems approach by Philp (1969). He suggests a group of procedures that includes specifying the characteristics of the required product, defining the variables which must be controlled in order to obtain these characteristics, determining acceptable standards for both product and process, identifying measures which will be indicative of performance and then making whatever judgements are required on the basis of this rather objective information (1969,p.283). It is useful to approach this problem in the manner of Phil but it suggests an oversimplification of the problem, and raises the question of what variables are to be used to measure what aspects of the system with what degrees of flexibility. Each of the steps suggested by Phil is important, but at each one the degree of sophistication to which the step is pursued is the central point.

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[6] Phillip refers to this approach as the aggregate method, "This method tried to relate educational needs to the whole demand of society for education rather than to the level of output or to manpower, and is based on norms and patterns which emerge from an empirical study of the educational situation in countries at different stages of development." (1964, p. 31).

If the fundamental emphasis is on narrow definitions of efficiency then product characteristics are easily specified, measures are easily determined, etc. But the result frequently is an inflexible, authoritarian system which has as its prime feature the ability to turn out products that are distinctly similar and reliable but quite limited in sensitivity and generally lacking of more highly valued characteristics such as creativity, sensitivity, spontaneity, etc.[7]

A feature mentioned by Philp, the distinction between product and process in the discussion of quality, is emphasized by Peters (1969, p. 149 ff.) as deserving further analysis particularly as discussion of the introduction and use of educational technology.

The issue of product quality centers on the criteria which can be developed for the "educated man" and include the development of various knowledges and skills in conformity to established expectations, and the development of a certain "wholeness" or "well-roundedness" that contributes to continued efficient functioning of the products. The process criteria are those "characteristics of institutions, curricula, teachers and procedures which encourage the development of quality in the product and hence give content to the notion of quality in the process sense" (Peters, 1969,p. 153). Process criteria focus

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7 See discussion of the narrowness of some approaches to efficiency in Boguslaw (1965) and Bertalanffy (1968,pp. 52-53).

on the means through which output is obtained as the means approximate or correlate with the product. Such things as academic qualifications of the staff, pedagogical procedures, amount or type of various aids, incentive/punishment systems used, or simply physical conditions and equipment (does the school have electricity?) are included here.

To illustrate the quantitative and qualitative problems within school systems in developing countries, two examples are offered. The first is the pressure on the school system of Brazil, which offers clear evidence of both problems. At the elementary school level (grades 1-4) only one-sixth of the entering students complete the four years and at any time only 57% of the population of the age range (7-11) is in school. The high dropout and grade-repeater rates are evidence of distinct qualitative lacks. This deficiency is further seen in the fact that 42% of the teachers in the elementary schools are "lay teachers" who have less than an eight grade education. There are reportedly wide shortages of instructional materials throughout the elementary schools. Efforts required to rectify some of these problems include more training for teachers, more instructional materials, more careful students evaluation, more facilities and many other steps which separately and in combination require heavy expenditures. Further, if quantitative factors are attended to, through increasing materials and facilities, there will be a significant increase in the numbers of students attending. As qualitative improvements are achieved the number of

dropouts and repeaters will go down and the total number in the school (particularly at grade two and beyond) will again increase. Obviously the response to quantitative requirements can decrease the quality of education and the response to qualitative requirements can increase the quantity of students to be educated, leading to a circular and seemingly unending problem.

A second example is drawn from Korea where 87-91% of the students in the primary age range (grades 1-6, ages 6-12) are enrolled in primary school and of those entering first grade 95% complete the sixth grade. The system has chosen to respond to the strong pressure from an education conscious populace and has made elementary education available to all children. But the flow of students from grade to grade, unfortunately, is an administrative not a programmatic decision, so that all students are 'passed' and an extremely heterogeneous population reaches the sixth grade. Quality is low primarily as it is reflected through a poor student-teacher ratio, and the lack of a reasonable student evaluation system. The problem is further exacerbated by the current plans to increase the number of students who will be allowed to enter the middle schools (grades 7-9) and the system by which these students will be chosen. Previously competitive examinations were used to choose entrants so that despite the broad range of capabilities of primary graduates only the best students could advance to the middle school. The new plan calls for a lottery system of selection for the middle schools (on the grounds that it is more equitable) at the same

time increasing the number of students who enter middle school from one-third to one-half of the primary graduates and eventually to all students so desiring. This passes the heterogeneity problem on to the middle school. At the same general time the system has announced intentions of lowering the student-teacher ratio from approximately 45.1 to 35.1, so that the Korean system, already faced with serious qualitative problems will increase these problems significantly.

In summary, there are quantitative and qualitative pressures and constraints on the education systems of developing nations. Political and social demands in these nations due to rising expectations of the peoples and the growth of the concept of education as a human right have forced most governments to increase the availability of education. Progress in increasing education has been distinctly great but the pressure of numbers will continue for some time. Qualitative pressures are now perceived and can be expected to grow. The attempts to make education available have not been matched by an equal increase in resources for education as those countries with the greatest demands also have the scarcest resources. Even in those countries where resources have increased the most,[8] they are still spread

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8 For example, Korea, Taiwan and the Philipines where educational expansion has outstripped economic expansion (Adams and Bjork, 1969).

thinner than they should be, in part because qualitative problems are difficult to discriminate particularly by those voices most demanding of more education, the lower classes and the political leaders. These decreases in quality have been in terms of various resource and process measures such as student-teacher ratios, student-facilities ratios, utilization of recognized procedures and methodologies and other related measures and also in product measures such as the overall perceived quality of the graduating students. Educational costs on a unit basis have also increased because of increases in system wastages and the lower quality of the output. So the qualitative problems must be addressed - must be solved, if education in developing countries is to continue to contribute to development. It is necessary to make changes in these school systems which will lead to significant refinement of the process characteristics which will then result in changes in product characteristics, or at least in the same level of product under the pressure of increased numbers of students and/or decreasing resources. It is necessary to maintain and frequently increase quality of education offered by the systems under circumstances where the number of students is increasing (or has recently experienced a significant increase) and where available resources are unlikely to increase significantly on either a unit or total basis. Simply put, more education for less or the same money is required.

Educational Technology as a Possible Solution

In an effort to respond to the problem facing developing nations the writers mentioned above stress the importance of investigating the potential of educational technology. The Pearson Report (1969, p.210) for example, suggests,

> ...the development of new technologies whereby a combination of elements could help to achieve an educational breakthrough... We recommend greater resources for (a) research and experimentation with new techniques, including television and programmed learning; and (b) a systematic analysis of the entire learning process as it applies to developing countries. (emphasis theirs)

Before discussingthe increased use of educational technology it is appropriate to examine what the term may mean and how it relates to areas such as human resource development, educational planning and international development education. Human resource development is the process of developing the knowledges, skills, abilities, and the general capacities of all the people in a developing society (Harbison, 1964, p.60).

One of the most important means of developing human resources is through education, particularly through formal education. Educational planning is a subject and a sub-set of human resource development and Coombs (1965, p. 4) offers an "ideal concept" of educational planning which he suggests should be a goal for planning, but which he readily admits is rarely reached.

> This ideal concept envisages educational planning, first, as embracing in orderly fashion all the levels and forms of educational activity, both formal and informal, within the country, and, second, as being fully integrated with the country's economic and social development plan, so that education may serve most efficiently and effectively the needs of both the nation and the individual.

Coombs feels that educational planning should focus directly on planning for educational change rather than simple planning to cope with educational growth, and this change orientation should operate from the standpoint of inventing, testing, modifying and implementing new learning systems and subsystems (1969 p. 33ff). In Coombs' definition, educational planning is synonymous with educational systems design, and goes beyond the conception of planning as primarily diagnosis and formulation activities to include development and implementation. A more limited definition of planning is suggested by Anderson (1969 pp. 261-262).

who urges a delineation between planners, researchers and administrators as separate but closely related functions. Lave and Kyle (1968) offer a model emphasizing the same features as those of Coombs, including generation of alternatives and testing of various approaches. Their model leads to implementation but retains its primary emphasis in the diagnosis and formulation areas. The question of the limits of planning leads to the consideration of the nature of educational technology and educational systems analysis.

Educational technology has received close scrutiny in recent years because it frequently seems to mean different things to different people. A basic agreement on the meaning of the term has been formed over the past few years and the features of the definition have taken shape in the form suggested by Gagne (1968, p. 6), who says it....

> ...can be understood as meaning the development of a set of systematic techniques, and accompanying practical knowledge for designing, testing, and operating schools as educational systems.

The general intent of this definition is also found in the definitions of Ullmer (1968,p. 13), Morgan (1969), The Commission on Instructional Technology (1970, p. 19), and Komoski (1966, p. 74). The basic feature of each of these definitions is that technology as used in the phrase "educational technology" or "instructional technology" emphasizes the broader meaning of

"...techniques for logically arranging things, activities or functions in ways that could be systematically observed, understood and transmitted." (Komoski, p. 74). As these authors emphasize, there is no mention of or necessity for the inclusion of machinery in any of the definitions, nor is there any commitment to the use of such things as computers, teaching machines or audio-visual devices such as television. The commitment is more toward an approach which is similar to and consistent with the systems approach (systems study, systems theory, systems analysis), which is the determination of a system and its operatio and interactions as they contribute to the system's functioning, with particular attention to the relative efficiency or inefficiency with which the system output is produced in terms of some concrete goals and objective. The definition is consistent with that of Banathy (1968, pp. 1-20), Kaufman (1968, pp. 419-421), Ryans (1964, p. 23) and Hoban (1968, p. 11). The systems approach is a sub-system of the broader domain known as general systems theory (Bertalanffy, 1968) and is not necessarily a single concept but a number of separate but similar approaches.[10]

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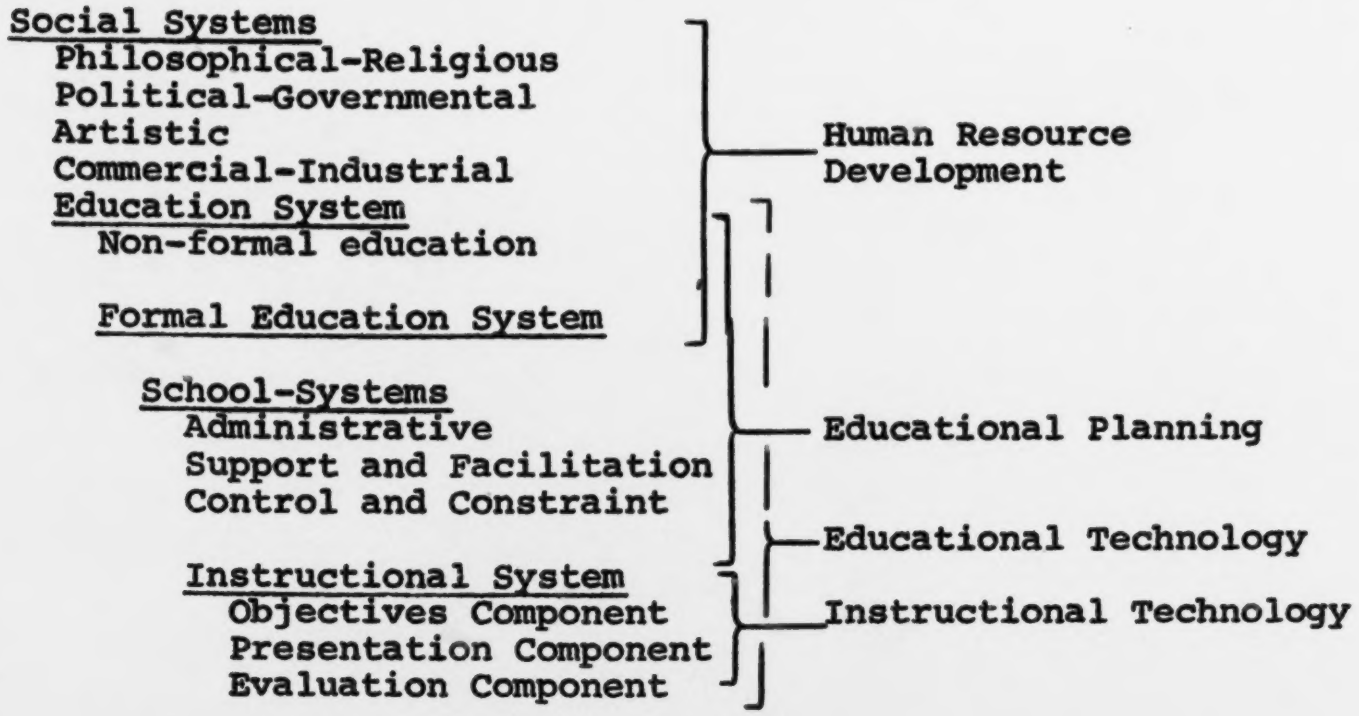
10 Bertallanffy lists twelve different systems theories and Boguslaw (1965) lists five different design approaches.

The place of educational technology in a general framework is not clear and it must be related to the total system. This may be done by sketching the relationship of education to broader conceptions and then identifying some of the main components which comprise education.

The education system is a sub-system of the larger societal system which is composed of govermental-political, commercial economic-industrial, philosophical-religious, artistic and other general systems. The education system is divided into units on the basis of structure and content with a non-formal education sector composed of a broad number of usually isolated areas including adult literacy, agricultural extension, industrial training, etc., and a formal structure of primary, middle, secondary and collegiate systems with interest distributed across a continuum from vocational to academic topics. These sectors overlap and interact in various patterns with varying amounts and types of interconnections. Each unit, each "school system" is divided into further subsystems such as administrative, supporting and facilitating, instructional and control or constraint components. Educational technology started in and has its primary focus on the instructional component level, taking as its emphasis the arrangement of the structure and processes of the component into conditions for optimal learning for the broadest number of students. This instructional component (viewed as system) can be further divided (Tosti, 1969) into objectives, presentation and evaluation components. It is then possible to speak of general areas of presentation technology (Tosti, 1969; Briggs,

1970), objectives technology (Mager, 1962) and evaluation technology (Popham and Husek, 1969), and to think of these in terms of both their specific features and their important and highly complex interactions.

Within this ordering of systems it is then possible to suggest focal points for the various genres which have been discussed, as shown in the following figure.



Interest at the higher levels of the system is found in several forms, one of which is human resource development. Education Planning (with education systems design emphasis) is primarily interested in the relation and interaction of the various units of formal and non-formal education within their own system domain and as they interact with the broader social systems, but generally does not extend to the specific features within the instructional system. The term instructional technology has been applied to that area which focuses distinctly

on those activities, processes and structures involved in the instruction of students. Educational technology is left in the center, overlapping both educational planning and instructional technology, with this wide breadth because of the varying definitions. The outline given is somewhat arbitrary and reflects the author's occasional frustration and annoyance with the lack of clarity and organization in many of the available definitions and discussions of educational technology. The arrangements and designations given here are not espoused as the definition but as a suggestion for the ordering of these terms and as a framework for the discussion of educational technology in development education.

Instructional and Educational Technology Projects in Development Education

The number of projects utilizing or centering on instructional or educational technology in the past decade is still small and is somewhat disappointing. The nature and results of most of these projects are also disappointing as few of the projects are carefully integrated and systematic efforts and most of them have little or no evaluation information. The majority of them are ad hoc media projects and must be judged from that standpoint.

The most thorough and useful study of educational media projects on an international basis is the work of Schramm, et. al. (1967) which closely examines twenty-three examples of innovative approaches in seventeen countries, most of which are developing countries. Television, radio, correspondence study,

films and audio-visual aids, and programmed learning in various mixes and alone are used for five purposes: upgrading existing instruction; teaching teachers; extending the reach of the school to new areas; literacy and fundamental education; and adult education and community development. The basic features of the distribution of projects, as suggested by Schramm (pp. 62-65) are that they are primarily presentational (media) innovations being used for a variety of purposes in a number of locations, regions and cultures, with no apparent restriction of one medium to any one problem. Schramm emphasizes that these projects are problem oriented and are not used alone, i.e., some attempt is made to integrate them into the system. But frequently the problem addressed or the extent of the innovation is quite limited and the general approach to the innovation is not systematic except in the most general sense. The analysis of the perform--ance of these cases of instructional technology is weak, in almost all cases being limited to observers' impressions and the attitudes of those involved in the projects.

A few of these projects offer enough general evaluative information to be examined and these will be reviewed before offering an overall analysis of these projects. The first is a broad scale attempt to introduce a comprehensive instructional television system in American Samoa, and must be rated as a major attempt at innovation. Yet this project never included an adequate and comprehensive evaluation component and the best evaluation is an unpublished Agency for International Development (AID) document which suggests, in summary, that the technique

of instruction had changed from rote learning to concept formation, that the curriculum had been completely revised, and high student attention and involvement achieved. It says, "...there indeed seemed little doubt that the television schools were far more effective than the non-television schools." (Block, 1965).

The Columbian television program is a major program for upgrading instruction and teaching teachers. It was assisted by AID and by Peace Corps in its early years and is now reaching 470,000 students. It has been evaluated by the Institute for Communications Research of Stanford University.[11] In eight major comparisons of television taught students versus conventionally taught students, three comparisons, grade 2 language, grade 5 mathematics, and grade 4 natural science, the television students were significantly better in overall acquisition while in five comparisons differences were not statistically signi-

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11 The Institute has issued a series of twelve reports on the Columbia project under the general title of The Peace Corps Educational Television Project in Columbia - Two Years of Research which may be obtained from the Institute for Communications Research, Stanford University, Palo Alto, California.

ficant (Schramm, 1967, p. 73). This project also reports significant results in teaching teachers. Teachers who viewed televised course in mathematics performed better than non-viewing teachers at " a very high level of statistical confidence." Teachers who also viewed a supervised discussion group did even better, and those "who viewed a televised class and also took the same class in residence learned considerably more (at the .005 level of significance) than either the students who took only the residence class, or only viewed the televised course." (Schramm et. al., 1967, pp. 70-78) By 1970 the Columbia project was reaching 470,000 or about one-third of all primary students in the country. Despite these successes this project is operated by and through the Ministry of Communications and is resented by the Ministry of Education and therefore has not achieved the support and acceptance which it needs for optimal functioning.

Schramm also reports on the success of the other various programs and although empirical data is scarce the general impressions generated by these programs are favorable. He emphasizes the importance of careful planning to insure that the projects have optimal chances of success, mentioning points from the systems approach such as careful problem analysis, a planned and phased introduction of the project, a well-trained technical and programmed staff, and high-quality media content, based on national goals. The last point is an important one, both from the standpoint of high quality and the relation of the content to national goals. The importance of the point may deserve further examination. The question of how an instructional

technologist goes about insuring that his efforts are consonant with the national goals of the country he is serving, requires further analysis.[12]

A new and ambitious project in instructional television (ITV) is the El Salvador program for educational reform which was started in August of 1968 and began to broadcast in February of 1969. This program has as its primary goal to rapidly bring about major reforms in the El Salvadorian educational system through the use of technology, and has the full backing of the government. ITV is the focal aspect of a program to bring about reform of junior high school education, including development of new educational objectives new and more effective instructional methods and the retraining of all teachers in the junior high school. Bernstein (1970) reports that in April of 1970 the new system is reaching 7,500 students in most of the country's seventh grade classrooms, with a goal of reaching 60,000 students by 1972. An encompassing evaluation design is being undertaken assisted by members of the Institute for Communication Research at Stanford University to carefully measure important project

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12 The author has recently prepared a paper on this subject entitled "Goal and Objective Setting for Developing Countries: A Model," which was prepared for the Youth Task Force on International Development, January, 1970.

variables such as student learning, teachers attitudes and administrative and societal effects. Initial results are favorable[13] but more information is required. The most important feature of this project is the systematic nature of its design, encompassing advanced planning, careful integration into the educational system and thorough formative and summative evaluation, it qualifies as a favorable example of educational technology.

The El Salvador project is something of an oasis. Throughout the developing world are a large number of small projects that border on or relate to instructional or educational technology. These projects include ITV efforts in various parts of Africa, Asia and the Middle East, programmed instruction projects in Zambia, Malawi, Czechoslovakia and Algeria, and various other projects sprinkled wherever there are interested educators. But a recent review of these and other efforts, "Educational Technology Around the World," (Chapman and Unwin, 1969) showed decidedly disappointing results. One should not get the impression that educational technology is sweeping the world! The number of countries which are interested and involved in projects is large, but with a few exceptions such as El Salvador, the projects are limited in scope and effect. In terms of the

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13 Dr. Stanley Handleman, Chief Education Officer, USAID, El Salvador. Personal Communication.

definition of educational technology given above relatively little of significance can be reported. Most of these projects or experiments are small scale efforts superimposed on an existing system rather than efficiently integrated into a new pattern. Most of the projects have lacked adequate planning, and evaluation and most of them appear to have achieved insignificant results other than to raise the costs of education. But results of a few of the projects, particularly those discussed above, do offer hope that more careful, well-planned, integrated projects may be able to have positive effects on the quality of education in these developing nations.

New Approaches in Education Planning, Systems Design, and Educational Technology

The major form of expansion in educational technology has been in the area of educational planning and systems design. The planning genre in development education has grown considerably in the past decade, and this area has always been at least peripherally interested in educational technology. The work of Schramm, et. al. (1967) for example, was addressed as a "memo to educational planners." The increase in planning for innovation generally stresses the use of educational technology as one of the central elements in plans for the future of education. Such emphasis seems to have raised the standing of educational technology in the eyes of many people, and it appears that a Zeitgeist is approaching and many organizations and/or nations have

moved into the planning stage, with major implementations seeming to be around the corner.

Coombs' works (1968, 1969, 1970), particularly The World Educational Crisis are important in this area because he, (a) provides a thorough analysis of the problem (which he calls the world educational crisis), (b) documents the nature of the problem as it occurs in many countries, and (c) gives sound advice for the direction which should be followed to achieve solutions. In his analysis he notes particularly the gaps between educational demand and supply, and between resources and requirements, the imbalance between educational outputs and jobs (resulting from what he refers to as the wrong educational mix), and the imbalance between formal and non-formal education.

In his suggestions for improvement, for a "new strategy of educational development," he stresses the need for a unified, selective, international strategy that includes a deep consensus and commitment from the nations involved, that gives its major emphasis on qualitative aspects of educational development, and that emphasizes, "a strategy of innovation, aimed at effecting a great variety of changes in educational systems, in order to help them...increase the efficiency and effectiveness with which they employ their limited resources." He notes that this new approach could be revolutionary and could provide an incentive to developing nations to break away from conventional educational patterns that have become obsolete and inefficient.

Coombs develops his case for educational innovation on a careful analysis of efficiency factors in education. His summary of these factors focuses on the labor-intensive nature of education, its continually declining competitive position in the manpower market, the need to strengthen teacher training, the heavy cost impacts of dropouts, repeaters, building requirements, automatic salary increases and retirement benefits.

Coombs calls for an approach emphasizing systematic analysis and introduction of innovations. He emphasizes the lessons for innovations to be learned from seven principles. These are: (a) the principle of individual differences which suggests that optimality cannot be achieved by ignoring the wide-range of students' abilities, aptitudes, rates and ways of learning; (b) principle of self-instruction which suggests that increased motivation results from allowing students to work on their own; (c) the principle of combining human energy and physical resources which suggests that more can be done by the student or teacher by placing more and better tools and technologies at his disposal; (d) the principle of economies of scale that suggests that expensive facilities and equipment can be made economically feasible if used on a large scale; (e) the principle of division of labor which suggests that people of differing skills, aptitudes, attitudes, and competencies should break a complex job into its component parts, matching teacher competence to the components; (f) the principle of concentration and critical mass;

(g) the principle of optimizing which says that overall optimum results come from appropriate combinations and interconnections of various resources.

Coombs also offers his list of prior ties for educational improvement. First, is modernization of educational management to equip the operators and controllers of the educational system with the skills and tools to handle their complex information flows, the resource allocation problems which they face. This training would emphasize modern management techniques based on systems analysis and operation principles, with emphasis on management teams of the highest possible quality. Second, is modernization of teachers, calling for a "drastic overhaul" of preservice training and of correct conceptualization of the teaching role. He stresses the potentialities of "divisions of labor" and suggests that this approach can have salutary effects. Third, is the modernization of the learning process, leading to a new combination of things, new approaches, new systems for learning that can do a significantly better job in terms of pedagogical and economic efficiency of output.[14] Fourth on Coombs' list of priorities is the strengthening of educational

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14 He doesn't seem to say it, but this also requires new definitions of what the output is to be, and a rigorous approach to the definition of "Efficiency" to avoid superficiality.

finance, recognizing that good education is not cheap, and that the system of education must be responsible in cost/effectiveness ways. Innovations here call for new ways of using funds to reduce inefficiency. The fifth priority is for greater emphasis on non-formal education, recognizing and capitalizing on the large number of things which persons of all ages learn outside of the formal system of education. This might mean significant reallocation of resources to "non-formal" areas.

One last feature of Coombs strategy must be mentioned. He strongly emphasizes necessity for widespread, serious international cooperation. By cooperation he suggests not just occasional international symposia but concrete collaboration, exchanges of information, programs, etc. And the direction does not have to be solely from "donor" to "recipient". As developing countries make progress in implementing new technological programs the flows of cooperation and information may reverse themselves with technical assistance going from poorer to richer nations (1968, p. 172).

Another important contribution, although only a single article and not a series of works like Coombs, is by Jacobs (1969) in which he reviews technology's role in education and is generally quite optimistic about its future, suggesting that such forces as the increase in knowledge, growth of school-age population, growth of school-age population, rising costs of education and new technologies will lead to, "...a sweeping revolution in education," (p. 154) resulting in great changes in

content, methodology, and philosophy of education.

An important part of Jacobs' discussion is a list of requirements for innovation to be effective. These include: trained innovators with skills in various developments in educational technology, systems approach to problem-solving, programmed instruction and teaching machines; organizational and administrative support; unrestricted experimentation, with ability to make radical departures; operational relationships interlinking research and operational programs; and clearly defined prerequisites, i.e., educational goals and objectives.

Jacobs also offers a developmental model as "one possible approach to broaden use of educational technology as an agent of change in development education." (p. 178) The model calls for the establishment of regional centers or institutions which would cooperatively identify common problems, involve key educators from each country in developing prototype solutions, use this solution development process as a curriculum for training a cadre of innovators experiment with the various solutions demonstrating their utility, feasibility and effectiveness, install them in local educational establishments, and continue the process by attacking other educational problems. As he summarized the model it

> ...(a) combines regional and national programs, (b) utilizes the process of innovation and the systems approach to problem-solving as the training experiences in regional centers designed

> to create the cadres of innovators needed in national programs, and (c) produces prototype solutions to common educational problems, which can then be tried out and adopted at the national level. (1969, p. 183)

Jacobs' article is optimistic and expresses hope for solutions to many problems of education throughout the world through use of educational technological innovations to solve specific problems on an indigenous basis. In his article he covers much the same territory as Coombs, reaching basically the same conclusions about the nature of the problems of world education, about the necessity of radical solutions, including widespread implementation of new technologies. Jacobs is less thorough than Coombs and more optimistic. While Coombs presses for new approaches he is not as explicit as Jacobs, nor as optimistic. Despite these differences the two articles are closely parallel.

Chadwick and Morgan (1970), following a problem analysis similar to that of Coombs and Jacobs, also suggest an educational systems analysis approach to the problem of international development education but in a more limited yet more concrete manner. They list six systems analysis areas and show how these might be intersected with various problem areas from developing countries. The instructional systems analysis areas are (1) problem identification and objectives analysis techniques, (2) formative evaluation techniques, (3) component analysis techniques, (4) design of new solutions (or redesign),

(5) implementation procedures, and (6) summative evaluation techniques. These techniques are then matricized with a group of problem areas considered by the authors to be important in terms of potential receptibility of innovation approaches. The areas are: (1) personnel development and leadership, (2) education systems objectives, (3) teaching staff utilization and training, (4) instructional procedures, (5) information control, utilization and dissemination. These areas all are part of or are related to Coombs' five priority areas.

The matrix of analysis and development techniques and their intersection with problem areas is an interesting and useful step because it allows the various operatives, researchers, Ministers of Education, etc., to move beyond recognition of problems to a framework for beginning to bring about innovations.

The discussion of Coombs, Jacobs and Chadwick and Morgan has been based on articles and books which they have produced. Recently the ideas which they have espoused have shown up in some important planning efforts in developing countries. The general approach which they suggest has been analyzed and, to some extent, adopted by the Agency for International Development (Bernstein, 1970), and can be seen in efforts in Korea and Brazil.

The Korean effort took the form of a study, conducted by the Florida State University to determine methods by which innovations in educational technology on a nation-wide basis can be feasibly applied in that country. The effort involves a study team comprised of seven people whose competencies include

educational economics, manpower needs analysis, technology, systems management, behavior technology, educational administration and teacher training.[15] The team surveyed the Korean education system from historical, cultural, demographic, economic, manpower and educational standpoints. On the basis of this survey, the team developed alternative strategies for system-wide education improvement. These alternatives delineate ways of arraying available resources, methods and technology to integrate optimal instruction and innovations for improving and expanding the Korean educational programs in a manner which will be genuinely responsive to social needs, as well as to economic and manpower needs projections of the country. The plans will be implementable within the estimated resources of the Republic of Korea Government, and will include estimates of cost-benefits of the various alternatives.

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15. The task force was headed by Dr. Robert Morgan. Members include Dr. Wesley Sowards, then Head, Department of Elementary Education, Florida State University (FSU), and now Dean of the School of Education, Florida International University; Dr. Sydney Grant, Director, Office of International Education, FSU: Dr. Richard H.P. Kraft, Associate Professor, Department of Educational Administration, FSU: Dr John Chang, Associate Professor, Department of Economics, FSU; Dr. Paul Gallagher, and Mr. Clifton Chadwick, Instructors, Department of Educational Research, FSU.

The general intentions and progress of this project is responsive to the frameworks outlined by Coombs, Jacobs, and Chadwick and Morgan. The problems faced by the Korean education system have been carefully analyzed in terms of the stated objectives and the resources available. The various alternative strategies suggested will take into account the potential various levels of economic growth, various levels of enrollment in various programs, various levels of unit cost per achievement specifications, and the potential outputs of educational innovations. The strategies will also attempt to provide for continuing experimental activities aimed at instilling the process of change, comparison and evaluation of efficiency of alternative measures and self-renewal into the system. Bearing in mind Coombs' emphasis on interrelationships the strategies will attempt to blueprint the necessary linkages to insure that more closely coordinated and connective practices can have an impact on the appropriate components of the educational sector.

The output of this extensive study, in the form of a group of recommendations about alternative strategies, will be made available to the Korean government for their consideration of its adoption. No commitments are assumed to be in effect from the Korean government and they may reject the entire study or, more likely, adopt only parts of it. If the general plan meets with approval it is expected that it will be further analyzed and developed in a research and development context over a period of a few years, potentially leading to system-wide adoption of

the most salient features of the plan within a period of three to five years.[16]

A significant new effort is also being undertaken in Brazil. This country is fraught with almost every imaginable educational problem from high wastage, high cost per unit of education achieved, low quality system output measurement, lack of pertinent system management information at all levels, poorly trained teaching staff (42% of primary teachers are "lay" teachers, for example), shortages of instructional materials at all levels, tremendous quantitative demands on the system, and generally low qualitative situation. In the face of these problems the government of Brazil has officially acknowledged that new patterns, methods and systems of education at all levels must be developed over the next decade. These new methods must respond to both quantitative and qualitative demands of the country, as usual, within the limited financial and human resource constraints one would expect from a newly developing country. The Brazilian program is described by Bernstein as,

> ...a large scale educational research and development project, utilizing a mix of educational technologies...linked to the nation's planning for a nation-wide in-school broadcasting system. Brazilian planning is keyed

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16 The report is expected to be complete in early 1971.

> to the possibility of the eventual deployment of a permanent satellite...(but) ...the utility of the educational system developed through the R&D effort will not be dependent on satellite transmission, but is expected to be equally effective initially through local broadcast capabilities and some microwave linkages. (Bernstein, 1970, p. 20).

Related to this effort is another aimed more directly at experimentation in various educational technologies which might be most effective for Brazil. The Education Plan of the Ministry of Education for the period 1970-73 tentatively includes the development of an advanced system of educational technology. The goal of this project will be

> to introduce into the educational system advanced systems of educational technology in order to overcome present educational problems and in order to be able to meet the foreseen increased demand. The expectation is that basic studies and experiments will be carried out to determine which of the various technologies should be implemented on a large scale basis. (USAID, Brazil, 1970, p. 29).

While the Brazilians have not yet developed and formalized a detailed plan for this effort, it is anticipated that AID will be able to provide assistance and support.[17]

Training and Dissemination

Another area of important activity is the dissemination of information about educational technology and training efforts in instructional technology and educational planning. This area has only recently received much attention, as "professional" contacts were predominant for the past decade. Recently AID has entered upon a program to disseminate vital information about the newest approaches to educational technology. This program includes the preparation of a film showing prime examples of educational technology which will be circulated in the near future. It also includes an extensive manual prepared by David Klaus of the American Institutes of Research (1970) analyzing the current state of the art in programmed instruction, computer-assisted instruction, learning theory, and the general field of instructional technology. This document was made available in the summer of 1970. AID also has distributed over 2000 copies of the four volume work by Schramm, et.al., which it originally contracted to The International Institute for Educational Planning. Further, the Agency distributes various

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17 Like all political decisions, this program is subject to change at any moment, due to a variety of factors.

publications, articles and relevant packets of professional materials through its various Missions around the world. The latest of these was the report of the Commission on Instructional Technology (1970).

In the area of training activity has been limited but apparently is growing. The Southeast Asia Regional Center for Educational Innovation and Technology (INNOTECH) has recently been established with funds from the Ford Foundation and AID. Its basic missions include developing new approaches to education and training educational technologists in systems analysis skills for regional needs. The Organization of American States (OAS) has developed plans for a series of four training centers in uses of educational television. These are to be in Argentina, Chile, Columbia and Mexico. A contract has recently been given to Florida State University to develop and operate several intensive workshops on instructional technology in Latin American countries including Brazil and Columbia, and to train Latin American graduate students.

A limited but interesting training activity is currently underway in India. Under the sponsorship of AID and operated by the National Education Association, an international study on the feasibility of using programmed instruction in developing countries has been developed and a pilot phase of the study has begun (Lange and Wedberg, 1970). Emphasizing programmed instruction (PI) and its potential contributions to education in developing countries, the project is examining relevant

features of programmed instruction including cultural implications and effectiveness. Workshops in Bombay and Poona have been held to train approximately 150 Indians in the use and preparation of programmed materials, and these trainees will then train other teachers and supervisors. It is expected that after the training usable materials will be produced, implemented and evaluated. While limited to programmed instruction, the project is interested in the systematic integration of PI into the overall education system and appears to be well planned and reaching a sizable number of supervisors and teachers.

What must educational technology do?

The most promising possibilities for the development of alternative solutions for the educational problems of the developing nations seem to be in the area of educational technology which, coupled with educational planning, offers broadly systematic new approaches for designing, developing, implementing and evaluating new instructional innovations which contain features which may possibly increase quality of output while holding cost constant. But a review of current and past efforts shows most projects have been ad hoc additions to existing systems with little planning and integration, disturbingly poor evaluation procedures and minimal effects. The only clear finding is that these projects can raise the costs of education

without necessarily doing anything else.[18]

But there is no necessity to write the epitaph for educational technology simply because the track record of process oriented media projects is not good. Stern admonitions, some soul-searching and an increased desire to upgrade performance of these and future projects definitely is in order. The successes of the Columbia ITV project and the good progress of the El Salvadorean project provide evidence that well-planned projects may be able to bring about meaningful achievements, but more emphasis on costs and cost-benefits is definitely required.

Increased effectiveness of the use of educational technology in development education requires emphasis on three features or aspects of educational technology. These three features interact and overlap to a considerable extent and have not been placed into a chart or diagram in order to avoid the oversimplified impression that they are clearly defined features amenable to compartmentalization.

The first feature is the necessity for educational technology to become distinctly problem-oriented in its approach to the developing nations. At first glance this may seem to be

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18 Commenting about "manifest foolishness," Ivan Illich (1970, p. 58) has suggested that, "...the Brazilians let U.S. experts peddle teaching devices that only raise the per capita cost of classroom attendance."

an unnecessarily obvious statement for one of the primary tenets of the systems approach is the careful analysis of the existing state of the system and the discovery of those areas where a discrepancy exists between the intentions of the system and its current performance. Yet throughout the developing nations the approach taken by both the aiders and the aided is not problem-oriented but usually solution-oriented. A popular solution of one sort or another is adopted by an AID representative or a national education minister and developed and applied to all problems that come along. One of the most popular solutions currently being offered for almost every problem is educational television conjoined with the use of satellites to enhance range and effectiveness. The potential or real availability of satellites and related technology has "turned on" more than one country to the use of ETV without necessarily ascertaining if this innovation fits with other resources of the country or adequately addresses the problems of the country.

The problem orientation should take as its primary focus discrepancies in the various aspects of the educational system starting primarily with the instructional component. The relation and nature of current resource and student inputs, operating processes, educational content and output adequacy should be closely scrutinized in an attempt to locate the most critical points of the system. The leaders and educators of the developing nations generally have sufficient information to isolate

these critical areas on a preliminary basis. Then, since problem analyses require some reference in terms of goals and objectives, the existing goal statements must be the starting point for the analysis. Frequently the first apparent problem in the system is the inadequacy of these statements of goals and objectives.

Closely related to the emphasis on problem analysis is the necessity to develop an approach that is sensitive and responsive to the unique features of the nations which educational technology is attempting to assist. This point may also seem obvious but in many aid situations the developing nations are being or have been encouraged and enticed to imitate the patterns of education of the aiding country even when such patterns are not particularly responsive or appropriate to the nation's needs (Coombs, 1968, p. 154). Current aid patterns lead many countries to being helped by the "flying educational technologist" who swoops in on a three day trip, has four meetings with education officials, two parties with the education minister and leaves behind a two page memorandum specifying all the "answers" needed by the country, with no recognition of the cultural, social or political factors which may affect that problem. By increasing the thoroughness of the problem analyses conducted in the developing countries many of these superficial or imitative solutions will be removed from consideration.

The second feature is an emphasis on the breadth of cost-proven alternatives which must be developed and made available to the developing nations to answer or respond to their problems.

This feature goes hand in hand with the need for problem analyses. To increase the range of available alternatives requires that educational technology must organize and clarify its basic principles and issues and develop and refine these principles into paradigms or models that demonstrate the value, the payoffs, of the use of the models by the developing nations. The cost issue must be emphasized. Computer assisted instruction costing $2.50 per hour or educational television at fifty-nine cents per hour are solutions for rich developed nations not for the large number of developing nations whose resource squeeze is intense. The innovations that educational technology offers must be thoroughly cost tested and developed into patterns of alternatives which can be integrated into existing systems in organized and efficient manners. Further, these innovations must be tested, simulated and modelled in a manner which establishes their relations with the other components of the educational system. For example, increased training of teachers may lead to more capable and appropriate performance by the teachers which may be a solution to one problem but may also lead to increased demands by the teachers for increased pay, causing another, probably greater problem.

More and better models must be developed making clear what incentives are available to developing nations through technology. For example, the costs of teachers are sixty percent or more of expenditures and continue to increase. What might be called for is a model (or models) showing how fewer teachers would be

required if the proper presentational and evaluational techniques were available and how self-instruction systems interacting with individual differences would allow students to complete their courses of study on the basis of their individual learning rates rather than on arbitrary time periods, so that large numbers of students may complete in less time, thereby reducing costs at two points. Without such cost incentives educational technology has nothing to offer developing nations.

The third feature which must be emphasized is the development and adoption of an aggressive evaluation posture. Concomitant to discrimination and rectification of problems in the educational systems is the ability and inclination to evaluate the system from several standpoints and for several purposes. The type of evaluation which is being stressed here is an expansion of formative and summative evaluation (Scriven, 1967) into a developmental evaluation with its primary emphasis on providing information on all aspects of the systems product and processes, its inputs, constraints interrelationships, etc. Such evaluation should include extensive procedures for student performance evaluation, techniques for discrimination of discrepancies (Provus, 1969), techniques for evaluation of the potentialities of various instructional models and alternatives available to the system, constant iterative information on the process of implementation and operation of curricular and organizational programs and a wide range of summative evaluation procedures for analyzing the effects of components of the

programs as they contribute to the output of the system. Throughout this evaluation emphasis should be placed on information which can be constantly reentered into the system (in a cybernetic fashion) to contribute to modification and improvement of system performance in a continuing fashion.

In the development of this evaluation posture careful attention must be paid to the development of adequate criteria, standards and ideals to be used in the evaluation of the system. Efficiency in educational systems is obviously a goal for the developing nations but control of efficiency is an area of unclear definitions and derivations and educational technology has yet to add clarification. Problems of what constitutes efficiency have rarely been adequately considered. Developing countries must evaluate not only the nature of the new educational alternatives they are considering, but the nature of the output required and the broader humanistic and social implications of various potential technological decisions that may be made within the confines of the educational system. Efforts must be made to identify and develop indices of the more subtle yet important social aspects of education to which educational technology must become responsively attuned.

Summary

The developing nations are faced with serious problems in their education systems and educational technology may be able to solve some of these problems. But to do so, and to place itself in a position to be seriously considered as a source of assistance, educational technology must demonstrate that it can and does adequately address the important problems, i.e., demonstrate that there is a payoff in the use of technology. To do this requires the organization and clarification of concepts and issues in educational technology and the development and testing of a series of models showing how various technologies and innovations may be used by the developing nations and how they may be thoroughly integrated into a broad system of educational change.

This development and integration cannot be achieved overnight if it can be achieved at all. Further, the domain of educational technology probably holds a good many solutions, but should not be expected, in any sense, to have all the answers. More than that, one would expect the serious educator in the developing nation (or elsewhere) to attempt to retain a broad perspective which would allow him to appreciate the benefits and strengths of educational technology, and to harness its potential without being trapped by it as an ethos, as he was so long trapped by the traditional approach. Keeping this broad perspective may be almost impossible for the harried educator of the developing nation, but it must be attempted.

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